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HOUSEKEEPERS' CHAT Monday, April 23, 1934.

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Subject: "Cooking on High." Information from the Bureau of Home Economics and the Weather Bureau, U.S.D.A., and the Colorado Experiment Station.

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Cooking on the mountain top is often a very different matter from cooking in the valley. Cakes and muffins, candy and icings, stewed and boiled foods, especially boiled vegetables don't act the same way at a high temperature that they do at sea level. In many cases, cooking on high -- anywhere from 3000 feet up -- requires different recipes from those that work so successfully at lower levels.

Some of the first people to discover that fact in this country were the covered-wagon housewives who crossed the plains years ago, and settled in Colorado, Montana, or some other mountainous region. Of course, they carried their favorite recipes with them. Imagine their disappointment when they discovered that the cooking directions they had been depending on all their lives didn't produce good results up in the mountains. Imagine how they felt when the first cake they tried to bake in their new home fell flat. No matter how many times they tried the recipe that had worked so well always before, the cake that came out of the oven was heavy and coarse in texture. The muffins also came out flat, and the popovers didn't pop as they should.

Well, at first these housewives thought the trouble was the difference in the flour and sugar they used. Later people began to suspect that it had something to do with the "atmosphere." Well, the women changed the proportions in their recipes this way and that until they could bake a light cake even in an oven ten thousand feet above sea level. By this trial and error method they eventually put together some workable high-altitude recipes. But it was only a few years ago that anyone tackled the problem scientifically. Then, foods specialists in some of the mountain states began to experiment and learn causes and effects in this matter of altitude cookery. The Experiment Station of the Colorado Agricultural College built an altitude laboratory to study how changes in altitude -- or atmospheric pressure -- affect the texture of cakes and quick-bread mixtures, and to learn how a sea-level recipe can be adjusted for each 1000 feet of change in altitude. Perhaps you never thought of it, but all our regular recipes in cookbooks and so on are planned for cooking at sea level and thereabouts.

Whether you live high or low, I'm sure you'll be interested in some of the discoveries about cooking at a high altitude. No telling when you may go to the mountains for the summer and want to bake a cake, for example.

In the first place, about this matter of atmospheric pressure. The weight of the air or the atmosphere above the earth's surface is known as the pressure of that atmosphere upon the earth. Just as the pressure of water is greatest at the bottom of the sea and becomes increasingly lighter as one approaches its upper

surface, so the pressure of air is greatest at the lowest surface of the earth and becomes lighter as one goes up -- climbs mountains or rises in an airplane. Well, cooking processes, especially those that include boiling, are affected by atmospheric pressure. For example, water at sea level boils at 212 degrees F., but at 5,000 feet it will boil when heated to only 203 degrees F. That means that at a high altitude boiling water is cooler than water boiling at sea level. So naturally many foods -- you'll notice this particularly with vegetables -- need more time if you boil them up in the mountains than if you boil them at the sea shore. The same thing applies to sugar mixtures such as candy and icings. They always must cook longer at a high than at a low elevation. Altitude counts in canning, also. You'll need to sterilize your jars longer if you live in the mountains.

But the influence of atmospheric pressure upon the baking of flour mixtures such as cakes and quick breads is more complex than it is in the matter of boiling. Here the various leavening agents and the gases they throw off are involved. In general, the experiments at Colorado prove that the higher the altitude, the more you must cut down on the sugar, the baking powder and the fat in a recipe. And the oven needs to be slightly hotter at a high altitude than at a low altitude. Mountain cooks have probably had greatest difficulty with rich cakes -- those containing a good deal of fat and sugar.

Just by way of illustration let me give you a simple cake recipe and show you how certain of the proportions would change if you moved to a higher altitude. Here's a good recipe for three-egg foundation cake. I'll give you first the original recipe with proportions suited to low levels up to 3000 feet:

3/4 cup of butter
1 and 1/2 cup of sugar
3 cups of sifted soft-wheat flour
4 teaspoons of baking powder
3/4 teaspoons of salt
1 cup of milk
3 eggs

You will bake this cake at 375 degrees F.

Now suppose you're moving to a home 5000 feet above sea level. How will you change this recipe? Well, you'll cut down only on the sugar, the fat, and the baking powder. All the other ingredients will remain the same. At 5000 feet you'll use 10 tablespoons of butter, 1 and 3/8 cup of sugar, and 3 and 1/8 teaspoons of baking powder. And you'll raise the temperature of your oven to 385 degrees F.

Now suppose you go up still higher -- say, to 10,000 feet. Well, here again you'll change only the fat, the sugar and the baking powder. At 10,000 feet you'll use only 9 tablespoons of butter, only 1 and 1/4 cup of sugar, and only 1 and 1/8 teaspoons of baking powder. And you'll raise the heat of your oven five points, baking at 390 degrees F.

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